



Hibbertia subvillosa (Dilleniaceae), a new Western Australian species segregated from *H. striata*

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Abstract

The south-west Western Australian species *Hibbertia striata* (Steud.) K.R.Thiele was reinstated in 2017, segregated from the historically misunderstood *H. huegelii* (Endl.) F.Muell. Since that time, field work has shown that *H. striata* comprises two distinctly different morphotypes. Plants from the eastern (drier) edge of the range are consistently single-stemmed at the base and are obligate reseederers after fire and other disturbances, in contrast to a more widespread morphotype (which includes the type of *H. striata*), that is abundantly multi-stemmed from the base and is a resprouter after fire. The difference in habit is consistent, has been observed at multiple locations and is consistently associated with distinct (though subtle) differences in leaf indumentum and morphology. The two morphotypes have not been found growing in mixed populations, due to habitat differences. Field work has shown that they are narrowly sympatric and do not intergrade where they approach each other; for this reason, and the consistency of both morphotypes over a wide range, they are regarded here as distinct species. The reseedling taxon has a validly published name, *H. huegelii* (Endl.) F.Muell. var. *subvillosa* Domin, and this is raised here to species rank as *Hibbertia subvillosa* (Domin) K.R.Thiele & T.Hammer.

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Introduction

Thiele (2017) reinstated *Hibbertia striata* (Steud.) K.R.Thiele (syn. *Candollea striata* Steud.) from the long-misunderstood *H. huegelii* (Endl.) F.Muell. (syn. *C. huegelii* Endl.) on the basis of a range of consistent morphological differences, the most noteworthy of which is that leaves of *H. striata* have a distinct, fine sulcus along the adaxial midline whereas those of *H. huegelii* have at

most a broad, open, obscure groove. The sulcus in *H. striata* is unique among Western Australian species of *Hibbertia*.

Hibbertia striata sensu Thiele (2017) is widespread in Western Australia, from the vicinity of Morawa to Bunbury. Most collections are from the Swan Coastal Plain, Jarrah Forest and southern Geraldton Sandplains IBRA (Interim Biogeographic Regionalisation for Australia)

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bioregions, with scattered collections from further east, mostly in the Avon Wheatbelt bioregion. Field observations since 2017 have shown that *H. striata* comprises two distinctly different morphotypes.

Plants of an eastern morphotype (occurring at the drier edge of the species range, in the Avon Wheatbelt) are obligate reseeder after fire and other disturbances. They reseed abundantly, often in areas that have been disturbed, such as road verges after grading, and grow strongly erect with a single stem at the base for several years. Old plants may come to develop several stems at ground level, but these result from the main stem splitting downwards from the lowermost branches along lines of weakness in the secondary wood, rather than from new shoots developing from the rootstock. Casual observations suggest that plants of this morphotype are relatively fast-growing and likely to be short-lived, but this would need to be confirmed using longitudinal studies.

In stark contrast, plants of a morphotype that occupies the main (western) part of the range are clearly resprouters after fire. They have a strong, persistent rootstock from which arise numerous, usually rather spreading, stems. Plants of this morphotype have been observed at multiple locations resprouting abundantly a few months after fire. Seedlings have rarely been observed and it is likely that, like many other post-fire resprouters, recruitment from seeds is rare. Observations of rootstocks up to 50 cm diameter suggest that plants are likely to be very long-lived.

In addition to the differences in their reproductive ecology and habit, the two morphotypes differ consistently, though subtly, in leaf indumentum and morphology. The abaxial midrib of the reseeding morphotype is consistently sparsely hairy for all or most of the length of the leaf, while in the resprouting morphotype it is consistently glabrous except towards the base. The leaf apex also differs slightly, with the reseeding morphotype having a blunter apex than the resprouting morphotype; leaves of the latter are also generally longer than those of the former.

Extensive field work has indicated that these morphotypes are narrowly sympatric, are morphologically distinct, and do not intergrade (that is, the easternmost occurrences of the resprouting morphotype are typical, as are the westernmost occurrences of the obligate-reseeder morphotype). In addition, they are ecologically distinct. The resprouting morphotype grows in kwongan and banksia woodlands on sandy soils, while the reseeding morphotype grows in eucalypt, acacia and melaleuca woodlands and shrublands on slightly heavier soils. Given these habitat differences they have not been found growing intermixed, but some populations of the two morphotypes grow <10 km from each other.

The resprouting morphotype includes the type of *H. striata*, collected in the vicinity of Perth by L. Preiss in 1839.

The reseeding morphotype also has a validly published name, *H. huegelii* (Endl.) F.Muell. var. *subvillosa* Domin, based on a specimen collected at Northam in 1900 by 'Gregory', presumably John Henry Gregory (1826–1914), who collected extensively around Northam in 1900–1901.

Given the ready segregation of *H. striata* into these two morphotypes, the consistent differences in habit, habitat, ecology and morphology, and the lack of intermediates, we regard that it is appropriate to recognise them at species rank, and herein describe the reseeding morphotype as *H. subvillosa* (Domin) K.R.Thiele & T.Hammer *comb. et stat. nov.*

It is noteworthy that both species share the distinctive narrow sulcus first noted by Thiele (2017) as a defining trait for *H. striata* as circumscribed at that time. There appears little doubt that the two taxa are closely related, presumably having diverged through ecological speciation following the evolution of differing life history strategies that are presumably adaptive in their respective environments.

Methods

All specimens at PERTH were examined, and extensive field observations made between 2017 and 2021. Types from other institutions were examined on Global Plants (<https://plants.jstor.org/>).

Taxonomy

Hibbertia subvillosa (Domin) K.R.Thiele & T.Hammer *comb. et stat. nov.*

Hibbertia huegelii (Endl.) F.Muell. var. *subvillosa* Domin, Věstn. Král. České Společn. Nauk. Tř. Mat.-Přír. 2: 73 (1923). Type: 'Northam, GREGORY X. 1900.' (syn: K 700375 image!; PERTH 3074927!).

Erect to spreading *shrubs* 30–50(–75) cm high, single-stemmed at base at least when young, with the stem continuing below ground as a simple taproot, obligately reseeding after fire; branchlets sparsely to moderately pubescent with arachnose, appressed, pale grey, simple hairs. *Leaves* widely spreading, scattered, linear to narrowly linear-obovate, (25–)30–50(–60) mm long, 1–2(–3) mm wide, the margins strongly revolute and completely obscuring the undersurface except the broad midrib (rarely loosely or narrowly recurved, the undersurface then largely visible); base broadly flattened and with a wide, shallow insertion on the stem, not forming a distinct petiole; adaxial surface smooth, flat to rounded with a distinct, narrow groove or sulcus along the midline, glabrous to sparsely or moderately appressed-pubescent to pilose with pale grey, simple hairs, the indumentum more dense towards the base especially along the margins where it sometimes forms a distinct fringe; abaxial surface (when visible) glabrous except the midrib, which has sparse, appressed to spreading hairs for most of its length; apex acute to sub-acuminate

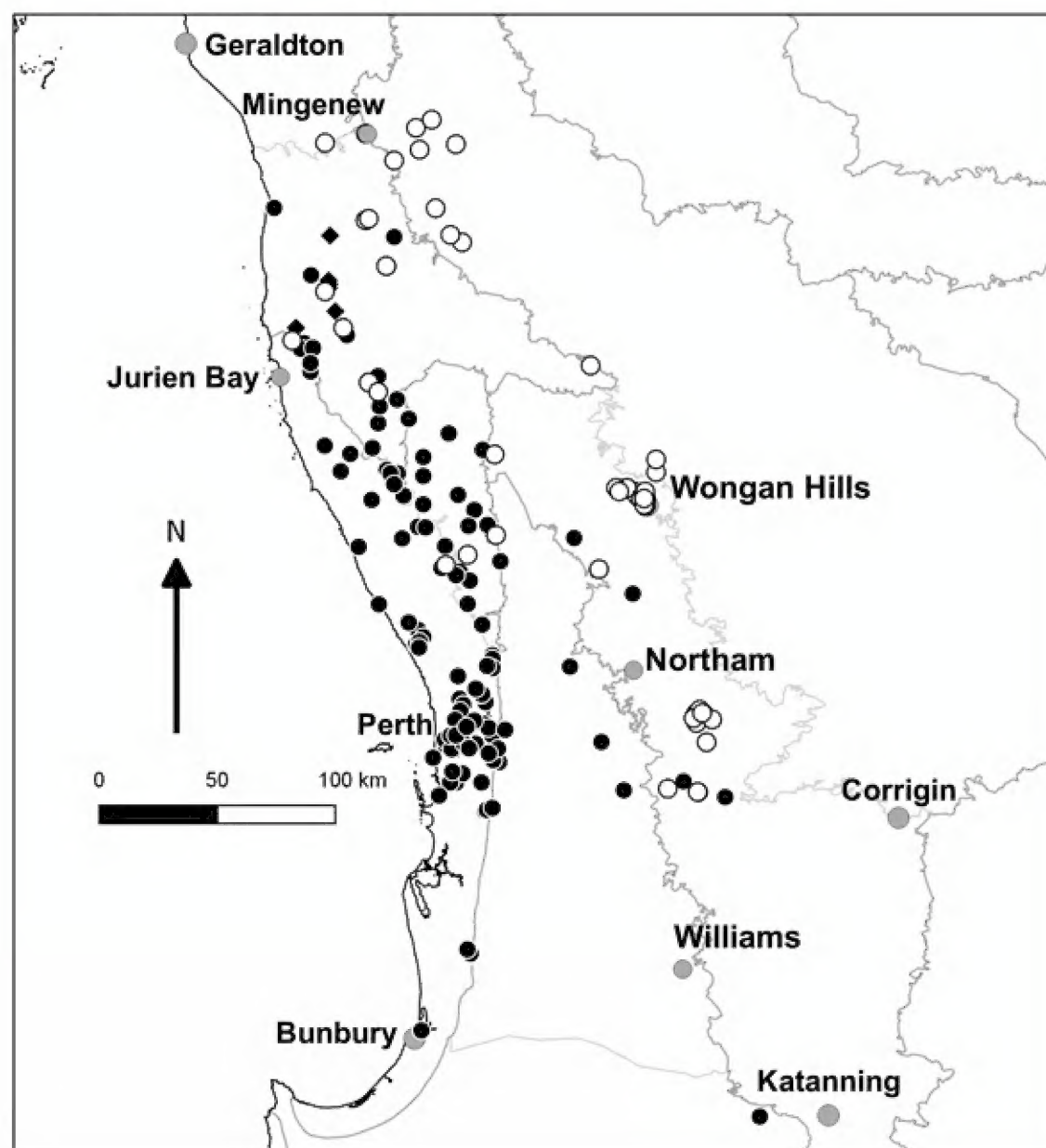


Fig. 1. Distributions of *Hibbertia subvillosa* (open circles), and *H. striata* (closed circles and diamonds); diamonds are broad-leaved specimens from the Eneabba-Warradarge-Mount Lesueur area (see Notes under *H. striata*). Towns are indicated by filled grey circles.

with the midrib extended as a thickened but non-pungent, straight to somewhat recurved point. *Flowers* sessile, single, terminal or terminating short-shoots in upper leaf axils; primary bract narrowly ovate-triangular, 6–15 mm long, herbaceous to somewhat scarious, with indumentum as for the leaves; secondary bracts usually several (rarely absent), grading to the leaves. *Sepals* ovate-acuminate (rarely ovate-acute), (10–)12–15 mm long, moderately (rarely densely) arachnose to spreading-sericeous with white, simple hairs; midribs not prominent; inner and outer sepals similar in size, apex shape and indumentum. *Petals* 5, yellow, obovate, 12–15 mm long, usually emarginate. *Stamens* (28–)30(–40), in 5 distinct bundles alternating with the carpels, each bundle with (5)6(–10) stamens, the inner one often $\pm$ free, the remainder distinctly fused by their filaments; filaments (including fused portion) 1.2–2.0 mm long; anthers rectangular, 1.8–2.5 mm long, dehiscing by introrse, longitudinal slits. *Staminodes* absent. *Carpels* 5; ovaries compressed-ovoid, glabrous; styles spreading widely and excentrically from the carpel apex, 2.5–5 mm long. *Ovule* 1 per carpel. *Fruiting carpels* and seeds not seen.

Selected specimens examined (numbers are PERTH sheet numbers): W of Morawa (5040590), Tathra National Park (3075060), Mingenew (3074935), Mooladarra Spring (3076016), Needling Hills (6084141), Beverley (3075974; 9261869), E of York (3075443), Goldfields Nature

Reserve (3075346), Boothendarra Hill Reserve (3075338), Eneabba (3076180), Irwin River (3037266), Piawaning (4466357), Three Springs-Eneabba (9259953), Wongan Hills (1234684; 3076172; 5683858; 9259961).

For full specimen details, see the following batch search of the ALA for the above set of specimens: https://biocache.ala.org.au/occurrences/search?q=qid%3A1656846590901#tab_mapView

Diagnostic features. Morphologically similar to *H. striata*, differing in its erect, reseeding, tap-rooted habit with usually a single stem at base (resprouting abundantly from a persistent rootstock in *H. striata*) and generally shorter leaves that have sparse hairs along the length of the abaxial midrib (abaxially glabrous except at the base in *H. striata*) with less acuminate apices. The leaf margins tend to be somewhat more loosely revolute in *H. subvillosa* than in *H. striata* (but see notes under the latter).

Distribution & Habitat. Restricted to south-west Western Australia, from the vicinity of Mingenew south to near Beverley, mostly along the western edge of the Avon Wheatbelt and the far eastern edge of the Geraldton Sandplains and Swan Coastal Plain IBRA regions. Occurs in eucalypt, acacia and melaleuca woodlands and shrublands, on slightly heavier soils than *H. striata*. Some of the westernmost collections (e.g. Hoogland 11964, Brand Highway at Boothendarra Creek) are in sandy



Fig. 2. *Hibbertia subvillosa*, photographed near Mingenew. Left-habit; note the erect growth form and single stem at base. Right-flower. Photos: R. Davis.

creek-beds, where there will presumably be frequent natural disturbance. Often grows on graded road-verges, where it sometimes recruits abundantly. It is particularly common on roadsides around Wongan Hills.

Conservation status. *Hibbertia subvillosa* is widespread, occurs in a number of nature reserves, and is not considered to be under threat. However, field work indicates that many populations are relatively small and weed-invaded. Many parts of the wheatbelt where it occurs have been heavily cleared, with native vegetation restricted to narrow roadside strips that are highly susceptible to weed invasion, fertilizer and pesticide drift, and other threats. The species could not be relocated at some locations where it had been collected in previous decades. Conversely, it is possible that some of the western-most populations of the species are adventive and that it is able to spread to a limited extent on graders and other road machinery. Given its susceptibility and occurrence in disturbed habitats, its conservation status should be assessed in more detail.

Notes. Thiele (2017) listed *Hibbertia huegelii* (Endl.) F.Muell. var. *subvillosa* Domin as a synonym of *H. striata*. The type of var. *subvillosa* clearly falls within the reseeding morphotype rather than within the narrower circumscription of *H. striata* established here, having an abaxial midrib with abundant sparse hairs along its

length. Its leaf margins are unusually loosely revolute, though some other specimens match it in this respect. Northam is within the range of the reseeding morphotype; while it has not been collected there in recent decades, it has been collected frequently around York, c. 40 km away and with similar habitats.

***Hibbertia striata* (Steud.) K.R.Thiele, *Nuytsia* 28: 248–250 (2017).**

Candollea striata Steud., in J.G.C. Lehmann, Pl. Preiss. 1(2): 275 (1845), non *C. striata* (Lindl.) F.Muell., Syst. Census Austral. Pl. 86 (1882), *nom. illeg.*, *nom. superfl.* (= *Stylidium striatum* Lindl.). Type: 'In arenosis prope oppidulum Perth, 6 Jun. 1839. Herb. Preiss. No. 2148.' (syn: BR 13462604 image!, FI 10053 image!, HBG 507147 image!, LD 1811953 image!, M 212901 image!, MEL 666854!, 666855!, 666856!, 666857!, 666858!, 666859!, MO 279481 image!, P 2142792 image!, 2142793 image!, 2142794 image!, S 08-20926 image!).

Excluded synonym: *Hibbertia huegelii* (Endl.) F.Muell. var. *subvillosa* Domin, Věstn. Král. České Společn. Nauk. Tř. Mat.- Přír. 2: 73 (1923).

Spreading *shrubs* (15–)20–50(–75) cm high, resprouting abundantly from a robust, woody rootstock after fire; branchlets glabrous to moderately pubescent with crisped, often arachnose, appressed, pale grey, simple

hairs. *Leaves* widely spreading, scattered, linear to narrowly linear-obovate, (35–)50–70(–90) mm long, 1–2(–8) mm wide, the margins usually strongly revolute and completely obscuring the undersurface except the broad midrib (rarely loosely or narrowly recurved, the undersurface then largely visible); base broadly flattened and with a wide, shallow insertion on the stem, not forming a distinct petiole; adaxial surface smooth, flat to rounded with a distinct, narrow groove or sulcus along the midline, usually glabrous except near the basal margins, rarely sparsely to moderately appressed-pubescent to pilose with pale grey, simple hairs, the indumentum more dense towards the base especially along the margins where it sometimes forms a distinct fringe; abaxial surface (when visible) and midrib glabrous except sometimes towards the base; apex acuminate with the midrib extended as a thickened but non-pungent, straight to somewhat recurved point. *Flowers* sessile, single, terminal or terminating short-shoots in upper leaf axils; primary bract narrowly ovate-triangular, 6–15 mm long, herbaceous to somewhat scarious, with indumentum as for the leaves; secondary bracts usually several (rarely absent), grading to the leaves. *Sepals* ovate-acuminate (rarely ovate-acute), (10–)12–18(–24) mm long, glabrous to sparsely or moderately appressed-pubescent or (rarely) spreading-sericeous, with white, simple hairs; midribs not prominent; inner and outer sepals similar in size, apex shape and indumentum. *Petals* 5, yellow, obovate, 12–18 mm long, usually emarginate. *Stamens* (28–)30(–35), in 5 distinct bundles alternating with the carpels, each bundle with (5)6(–8) stamens, the inner one often $\pm$ free, the remainder distinctly fused by their filaments; filaments (including fused portion) 1.2–2.0 mm long; anthers rectangular, 1.8–2.5 mm long, dehiscent by introrse, longitudinal slits. *Staminodes* absent. *Carpels* 5; ovaries compressed-ovoid, glabrous; styles spreading widely and excentrically from the carpel apex, 2.5–5 mm long. *Ovule* 1 per carpel. *Fruiting carpels* and seeds not seen.

Selected specimens examined (numbers are PERTH sheet numbers): Whitby (5019028); Mungedar (3076059); Mundijong (3075885); Ellis Brook Valley Reserve (5582679); Jurien Bay (3075397); Cataby (3075354); Beverley (3075451); Three Springs (3037096); Helena Valley (3074862); Lancelin (3075265); Bullsbrook (8123977); Kojonup (5632994). *Broad-leaved specimens*: Eneabba

(3074900, 3074919, 2387131); Cockleshell Gully (3075427).

For full specimen details, see the following batch search of the ALA for the above set of specimens: https://bio-cache.ala.org.au/occurrences/search?q=qid:1663989222158#tab_mapView

Notes. See under *H. subvillosa* for differences.

Thiele (2017) noted that some plants of *H. striata* from the vicinity of Eneabba, Warradarge and Mount Lesueur often have broader leaves with the margins scarcely recurved and hence with the abaxial leaf lamina surface exposed; specimens from elsewhere in the range of the species consistently have narrow leaves with margins revolute to the midrib. Field observations along Cockleshell Gully Road in Mount Lesueur National Park show that both broad- and very narrow-leaved plants occur in the same population, the former on younger plants or on vigorous shoots of older plants, the latter on older plants that are growing less vigorously. While some broad-leaved plants from this area are highly distinctive and have very different leaves from elsewhere in the range, it remains the case that the species cannot be justifiably split on this basis, unless and until further characters are found or genetic work shows that they are distinct.

Acknowledgments

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